



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US97/03647 <b>(22) International Filing Date:</b> 11 March 1997 (11.03.97)  <b>(30) Priority Data:</b> 08/618,414      15 March 1996 (15.03.96)      US  <b>(71) Applicant:</b> MCI COMMUNICATIONS CORPORATION [US/US]; 1133 - 19th Street, N.W., Washington, DC 20036 (US).  <b>(72) Inventor:</b> REYNOLDS, Kevin, T.; 248 Dogwood, Plano, TX 75075 (US).  <b>(74) Agent:</b> BELSER, Townsend, M., Jr.; Pollock, Vande Sande & Priddy, R.L.L.P., Suite 800, 1990 M Street, N.W., Washington, DC 20036 (US).		<b>(81) Designated States:</b> CA, JP, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> MOTION DETECTION FOR PREVENTING REMOVAL OF A FIXED WIRELESS TERMINAL  <b>(57) Abstract</b> <p>Method and apparatus for deterring fraudulent use of a fixed wireless telephone (101), comprising sensing motion of the telephone with a motion sensor (105) and preventing operation of the telephone (101) after it has been placed in motion and until entry of a security code to reset operation of the telephone (101). A central facility may also be automatically notified in the event movement of the telephone (101) is detected.</p> <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 45%;"> </div> <div style="width: 45%; text-align: center;"> </div> </div>		

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**MOTION DETECTION FOR PREVENTING REMOVAL  
OF A FIXED WIRELESS TERMINAL**

**FIELD OF THE INVENTION**

This invention relates generally to prevention of  
5 fraudulent use of a wireless telephone, especially a  
fixed wireless terminal.

**BACKGROUND OF THE INVENTION**

Wireless telephone units (WTU's), such as public  
cellular phones, present a practical and easy solution to  
10 the problem of providing telephone service to areas not  
accessible by current wire based telecommunications. For  
example, WTU's may be deployed along roadways for  
emergency use, or may be readily set up in common areas  
to provide pay telephone service. When a WTU is used in a  
15 fixed location, it may be referred to as a fixed wireless  
telephone unit (FWTU). FWTU's can provide a quick and  
cost efficient public telephone to any area, particularly  
remote areas in which there is little or no wireline  
service.

20 However, existing FWTU's suffer from the  
inconvenience that they may be readily abused or misused.  
For example, although the FWTU is designed for fixed  
usage, because the FWTU is a wireless unit, it may simply  
be removed from its mounting and thus become a defacto  
25 mobile telephone. Thus, the misuser of a personal FWTU  
may obtain the benefit of a mobile cellular phone while

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paying the rates for a stationary fixed phone, which rates are generally less than the rates for mobile phones. Or, a personal or public FWTU may be stolen.

5       Once in private possession, a stolen FWTU may be altered to provide free unlimited access to the telecommunication network with which the FWTU communicates. As a result, a practical anti-movement, anti-theft, and anti-vandal method and apparatus is needed to deter the fraudulent use of FWTU's. Current  
10       technology for protecting the integrity of a telephone relies on the fortification of the telephone to prevent removal. Various materials are used for fortification. However, as a method of resisting telephone abuse, the fortification methods have many disadvantages, including  
15       being heavy and hard to install, still subject to theft, and difficult to locate when stolen. Thus, such private and public FWTU's can be relocated to a private location and machined to remove any armour.

20       A variety of such security features have been used in the past. Examples of such prior art features are described in the patents mentioned below.

      U.S. Patent No. 5,109,412 to Hollowed et al. discloses a public cellular telephone securing apparatus that secures the hand held telephone to its holder. The  
25       securing apparatus releases the telephone upon proper activation of the telephone unit, including credit card usage.

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U.S. Patent No. 5,134,654 to McGough discloses a stainless steel shield covering the entirety of the outside face of a public telephone. Operating in conjunction with a securing mounting, the shield provides protection against unauthorized relocation, theft and vandalism.

U.S. Patent No. 5,283,546 to Scop et al., discloses a vandal-resistant call box that uses a magnetic switch and magnet to determine the position of a handset.

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#### SUMMARY OF THE INVENTION

A principal object of the invention is therefore to provide a method and apparatus for detecting and deterring movement of a FWTU.

Another object of the invention is to provide a method and apparatus for deterring theft and vandalism of FWTU's.

A further object of the invention is to provide a method and apparatus that completely disables a FWTU upon detection of movement because of unauthorized tampering.

Another object of the invention is to provide cost effective and readily available theft and vandalism deterrence.

The present invention, provides a method and apparatus having these and other features for deterrence of theft and vandalism. The FWTU of the invention is provided with a motion detector in electrical connection with the FWTU central controller, so that when the motion

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detector detects motion disturbing the equilibrium of a mercury switch or equivalent, the FWTU central controller is instructed to completely disable the FWTU. This makes the entire unit inoperative and useless to the tamperer or thief. Operation of the FWTU may be restored by a reset function responsive to entry of a security code with the telephone keys. An important advantage of this invention is that it allows the use of small, light weight FWTU's, which are easier to handle and install than current FWTU's that are made extra heavy to discourage unauthorized movement

#### BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the present invention can be obtained by considering the following more detailed description in conjunction with the accompanying drawings, in which:

Fig. 1 depicts a public FWTU in accordance with the invention, and

Fig. 2 depicts a flow chart of the operation of a FWTU.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The following detailed description of preferred embodiments of the invention is applicable to numerous anti-tampering techniques, as may occur to those of ordinary skill when they learn of this disclosure.

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Fig. 1 depicts a public FWTU. The FWTU includes a housing 101 secured to a stand 106 which has a base 110 secured to the ground by spikes 107. The FWTU includes an antenna 108 for communication with a cellular network.

5 A phone handset 103 is held within a cradle 104 when not in use, and keypad 102 is used for numeric input into the FWTU. The FWTU includes an internal motion detector 105, which may be a mercury switch, a cantilever beam switch, or a similar device, located within the outer housing 101

10 to detect any disturbance with the location of the FWTU. In Fig. 1, motion detector 105 is shown as a mercury switch having a bulb 112 containing liquid mercury 114 for connecting electrical contacts 116 and 118 upon any tilting of housing 101, such as would be caused by

15 removal of the housing from its stand 106.

Fig. 2 depicts a schematic diagram of the operation of a FWTU with the motion detector of the invention. In normal operation, the CPU/Central Controller 203 controls operation of the internal workings of the FWTU and its

20 electrically connected components, which include a Keyboard and Display 204 for the input and output of information to the CPU 203, a voice Coder and Decoder 205, a Modulator and Demodulator 206, a Handset 214 for generating voice signals, and a Receiver and Transmitter

25 207 in electrical connection 209 with Antenna 202 for transmitting and receiving telephone communications. The Keyboard and Display 204 is preferably located on the exterior of the FWTU's housing so that its keyboard

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component may serve the same functions as keypad 102 of Fig. 1.

When tampering is detected by closure of the switch of motion detector 201, a reset function signal is sent via connection 208 to CPU 203 to cause its microprocessor to reset its operating sequence to a stage requiring further input, thereby disabling the FWTU operation. Motion detection 201 comprises a switch having an electrical connection 212 shown disconnected from a contact 213. When connection 212 is connected with contact 213, the reset signal is allowed to flow to CPU 203. Before CPU 203 resets its microprocessor, the reset signal may be compared with a predetermined noise threshold to determine that the FWTU has been moved.

AC to DC power conversion and DC power can be supplied to motion detector 201 by a power conservation module 211. As an alternative to a special power module, motion detector 201 can be attached to a main or back up battery power supply to effect disabling. In an alternative embodiment, the motion detection switch can be located so as to interrupt the normal power supply to the CPU, thereby causing it to be reset to the beginning of its boot sequence and to subsequently reach a stage requiring further input.

As a further alternative, the status of the motion detector switch may be polled periodically by a detection program and the microprocessor reset by software commands when switch closure is detected. This alternative may



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provide motion detection that is more difficult to avoid by a person attempting to misuse the terminal by disconnecting the motion detector, because the detection program and polling circuitry could recognize such an unauthorized disconnection.

In the case of unauthorized removal, the FWTU may also initiate a telephone call to a central facility in order to send an alarm signal indicating theft of the telephone. The FWTU may also continue to periodically send an alarm signal for use as a homing signal to help to locate the wireless telephone in the event of its unauthorized removal.

In the event normal operation of the FWTU is interrupted by the reset function, the invention further includes in the preferred embodiment a restoration capability. In order to restore normal operation, authorized personnel may input an authorization code through the usual keypad 102, or through the keyboard 204 for the CPU 203. Where the removal is authorized, such as for maintenance of the unit, a code for deactivating the reset function may also be entered through the keypad 102 or the keyboard 204.

While this invention had been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art after they learn of the invention. Accordingly, the preferred embodiments of the invention set forth herein

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are intended to be illustrative, not limiting. Various changes may be made without departing from the spirit and scope of the invention as defined in the claims set forth below.

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CLAIMS

What is claimed is:

1. A wireless telephone having a base and a handset wherein said base is adapted for stationary usage only, and wherein said wireless telephone comprises means for preventing operation of the telephone in the event said base is moved, said preventing means comprising:

a motion sensor located in said base for generating a movement signal indicating movement of said base; and,

means responsive to said movement signal for preventing operation of the telephone.

2. The wireless telephone according to claim 1, wherein the motion sensor comprises at least one of a mercury switch and a cantilever switch.

3. The wireless telephone according to claim 1, wherein said preventing means comprises a microprocessor for preventing operation of the telephone upon receipt of said movement signal.

4. The wireless telephone according to claim 3, wherein said preventing means further comprises software for resetting said microprocessor in response to said movement signal.

5. The wireless telephone according to claim 1, wherein said preventing means comprises means for interrupting power to the wireless telephone.

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6. The wireless telephone according to claim 1, further comprising means responsive to said movement signal for alerting a central facility of telephone base movement.

7. A wireless telephone comprising means for inhibiting unauthorized movement of the wireless telephone, said inhibiting means comprising:

a motion sensor for generating a motion signal indicative of mobility of said wireless telephone;

means responsive to said motion signal for preventing operation of the telephone;

means for entering an authorization code indicating authorized operation of said wireless telephone; and,

means for restoring operation of the telephone upon receipt of said authorization code.

8. The wireless telephone according to claim 7, wherein the motion sensor comprises at least one of a mercury switch and a cantilever switch.

9. The wireless telephone according to claim 7, wherein said inhibiting means comprises a microprocessor for preventing operation of the telephone upon receipt of said motion signal.

10. The wireless telephone according to claim 9, wherein said preventing means further comprises software for resetting said microprocessor in response to said motion signal.

11. The wireless telephone according to claim 7, further comprising means responsive to said movement

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signal for alerting a central facility of telephone base movement.

12. A method of preventing operation of a wireless telephone having a base and a handset, upon movement of the base, wherein said base is adapted for stationary usage only, said method comprising steps of:

5 receiving a signal from a motion sensor mounted within the base of the wireless telephone;

comparing said signal with a threshold to determine that the telephone base has moved; and,

10 preventing operation of the telephone upon a determination of telephone base movement.

13. The method according to claim 12, wherein the motion sensor comprises at least one of a mercury switch and a cantilever switch.

14. The method according to claim 12, wherein wireless telephone operation is prevented upon receipt of the signal by a microprocessor.

15. The method of claim 14, wherein said microprocessor is reset in response to said signal.

16. A method of inhibiting unauthorized movement of a wireless telephone comprising steps of:

placing a motion sensor within a housing of the wireless telephone;

5 electrically connecting the motion sensor with a microprocessor of the wireless telephone so that a signal from the motion sensor is detected by the microprocessor; and,

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preventing operation of the wireless telephone after detection of the signal from the motion sensor.

17. The method according to claim 16, wherein the motion sensor comprises at least one of a mercury switch and a cantilever switch.

18. The method according to claim 16, wherein wireless telephone operation is prevented upon receipt of the signal by a microprocessor.

19. The method of claim 18, wherein said microprocessor is reset in response to said signal.

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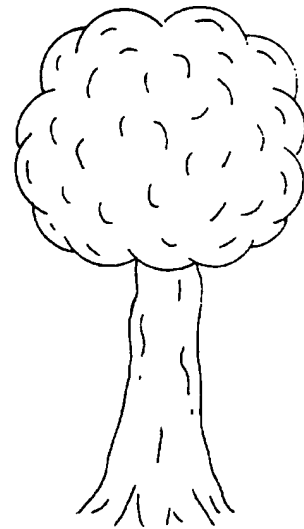
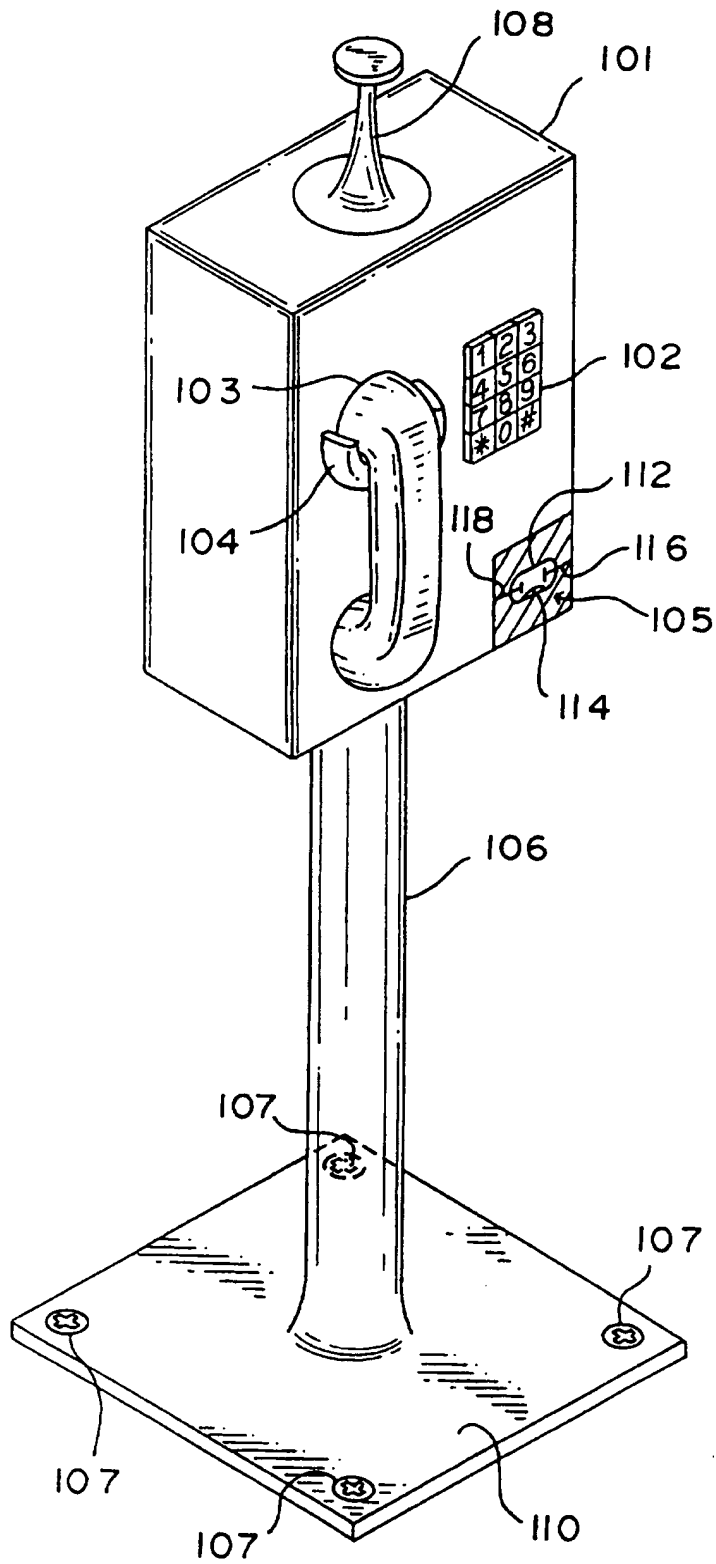


FIG. 1

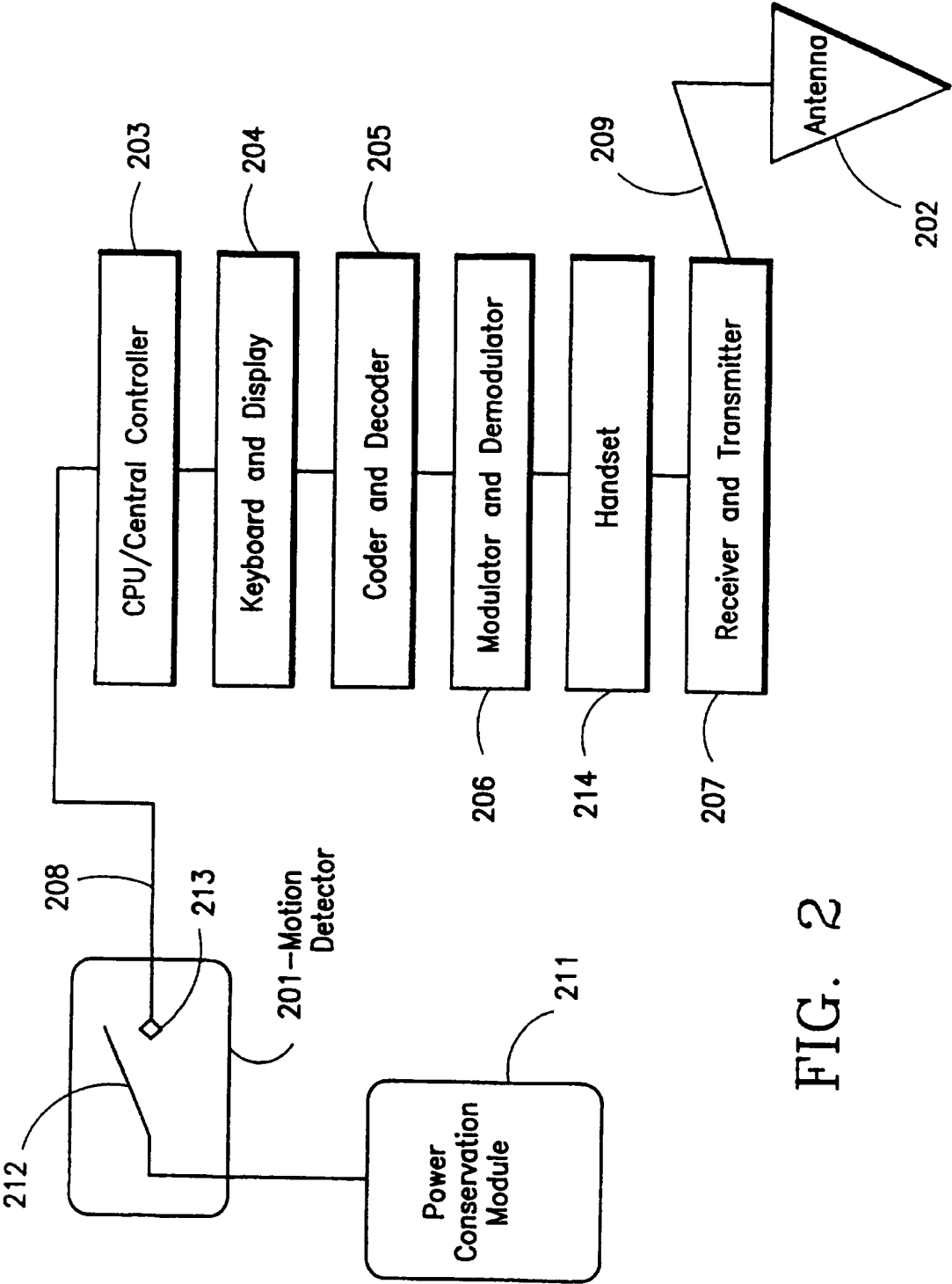


FIG. 2



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/03647

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H04M 17/00, 11/04; G08B 13/14

US CL : 379/145, 37, 40; 340/ 571, 686

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/ 58-60, 61, 143, 145, 145, 37, 39-45, 51; 340/ 501, 568, 571, 686, 687, 689

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
noneElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
none

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,724,538 A (FARRELL) 09 February 1988, col.4.	1-19
Y	US 5,406,261 A (GLENN) 11 April 1995, figures 5-7 and col.7.	1-19
Y	US 4,608,674 A (GUSCOTT) 26 August 1986, figure 1 col. 1 lines 20-36.	12-15
Y	US 5,467,076 A (RUOCCO et al) 14 November 1995, figure 1 and col.3.	6 and 11
A	US 4,928,299 A (TANSKY et al) 22 May 1990, entire document.	1-19
A	US 4,954,813 A (AUGUST, Sr. et al) 04 September 1990, entire document.	1-19

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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